

Amendment under 37 C.F.R. §1.111
Attorney Docket No. 062918
Application No. 10/598,194

REMARKS

Claims 1-18 are pending in the present application. Claims 1, 2, 4, 7, 13-16 and 18 are herein amended. Claims 19 and 20 are herein canceled. No new matter has been presented.

Applicants gratefully acknowledge that claims 11-13 recite allowable subject matter.

Claim Rejections – 35 U.S.C. § 112

Claims 10, 19 and 20 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Claims 19 and 20 have been cancelled.

Regarding claim 10, the Office Action takes position that the following limitation is unclear: “wherein the flight path of said time-of-flight mass spectrometer is positioned inline with the ejection path of ions.” The Office Action further states that it is unclear how the flight path of the TOF-MS can be in line with the ejection path of ions if it is an orthogonal TOF-MS. (Office Action, page 3.)

Applicants respectfully submit that the ion trap is a “linear” ion trap and thus, the flight path of the TOF-MS can be in line with the ejection path of the ions. (See Fig. 5.)

Withdrawal of the § 112 rejection is requested.

Claim Rejections – 35 U.S.C. §§ 102 and 103

A. Rejections based on Okumura and Okumura in view of Schwartz

Claims 1 and 4-9 were rejected under 35 U.S.C. § 102(b) as being anticipated by **Okumura** (US 2003/0066958); and claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Okumura** in view of **Schwartz** (US 2005/0017170).

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Favorable reconsideration is requested.

Claim 1 has been amended to recite that the set of DC voltage supplies provide discrete DC levels “for trapping ions, for optimizing the distribution of the trapped ions, and for ejecting the trapped ions from the ion trap.” Support for the amendment is in the specification at, *e.g.*, pages 6-8. Applicants also amended claim 1 to change “capable of connecting” to “for connecting” for clarification.

Applicants respectfully submit that Okumura does not teach or suggest:

a set of DC voltage supplies to provide discrete DC levels for trapping ions, for optimizing the distribution of the trapped ions, and for ejecting the trapped ions from the ion trap and a number of fast electronic switches for connecting and disconnecting said DC supplies to at least two said electrodes of said ion trap

as recited in amended claim 1.

Okumura uses DC voltages for ion ejecting and high-frequency voltages for ion trapping (Paragraph 38: “In accumulating ions, a high-frequency voltage is applied to the ring electrode.”) In contrast, present claim 1 recites the use of DC voltages for trapping ions, for optimizing the distribution of the trapped ions, and for ejecting the trapped ions from the ion trap.

The difference in the ion trapping voltages between Okumura and the present invention causes the different performance of TOF mass analysis in terms of resolution and mass accuracy as stated below.

When RF voltage supply is turned off, the voltage in the ion trap does not disappear immediately. Though the RF voltage applied to the ring electrode is described to be switched to the DC voltage immediately in Figure 2 of Okumura, the residual voltage actually exists after the

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RF voltage is cut down. The residual voltage disturbs the motion of the ions in the ion trap and the mass spectrometry analyses are affected adversely. In contrast, residual voltages can be denied in the present invention by applying the reverse DC voltage. Thus, the present invention succeeds in the improvement of the performance of TOF mass analysis.

Accurate control of the timing to switch off the voltage supply is essential to obtain proper reproducibility in TOF mass analysis. It is easy to accomplish the accurate control when using DC voltages. However, RF voltage is not appropriate to be accurately controlled because of the fluctuation in the voltage.

Regarding claim 7, Applicants amend “the plane of said ejected ions” to make it clear that a flight path (y-axis) is orthogonal to the central axis of the trap (z-axis) and the ejection path of ions (x-axis). This amendment is based on Figure 4. Such construction is not possible in a 3-D ion trap as disclosed in Okumura.

B. Rejection based on Ding in view of Okumura

Claims 14-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Ding** (US 7,193,207) in view of **Okumura**. Favorable reconsideration is requested.

Claim 14 has been amended to recite that the step of switching from a pre-selected trapping state to a final ejection state is in a condition of pure electrostatic field within the ion trap in a pre-selected time by elongating the switching period of the trapping states. Support for the amendment is in the specification at, *e.g.*, page 13.

Applicants respectfully submit that Ding in view of Okumura does not teach or suggest:

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trapping said ions in said ion trap by switching between a set of trapping states defined by a set of voltage states on the electrodes of said ion trap;
... [and]

switching from a pre-selected trapping state to a final ejection state in condition of pure electrostatic field within the ion trap in a pre-selected time by elongating the switching period of the trapping states

as recited in amended claim 14.

Claim 14 provides optimization of the distribution of the trapped ions in the ion trap to eject all the ions in the ion trap. In contrast, the purpose of Ding is to excite resonant oscillatory motion of the ions effectively; not to eject the trapped ions toward the TOF mass spectrometer.

In claim 14, ions are trapped by switching the voltage of the ion trap between discrete DC levels and all the ions trapped in the ion trap are ejected by elongating the switching period of the trapping voltages (*see* Fig. 6) and applying the pulsed voltage. Such configuration is not disclosed in Ding.

For at least the foregoing reasons, claims 1-18 are patentable over the cited references. Accordingly, withdrawal of the rejection of claims 1-12 and 14-18 is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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